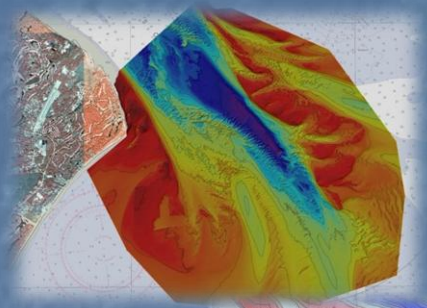
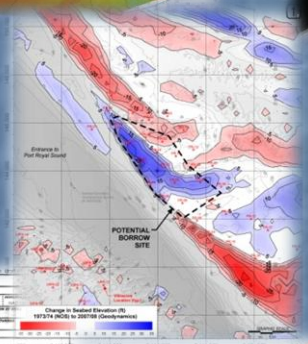
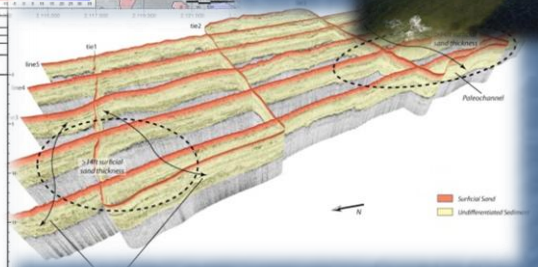
EXPERIENCES on HILTON HEAD ISLAND



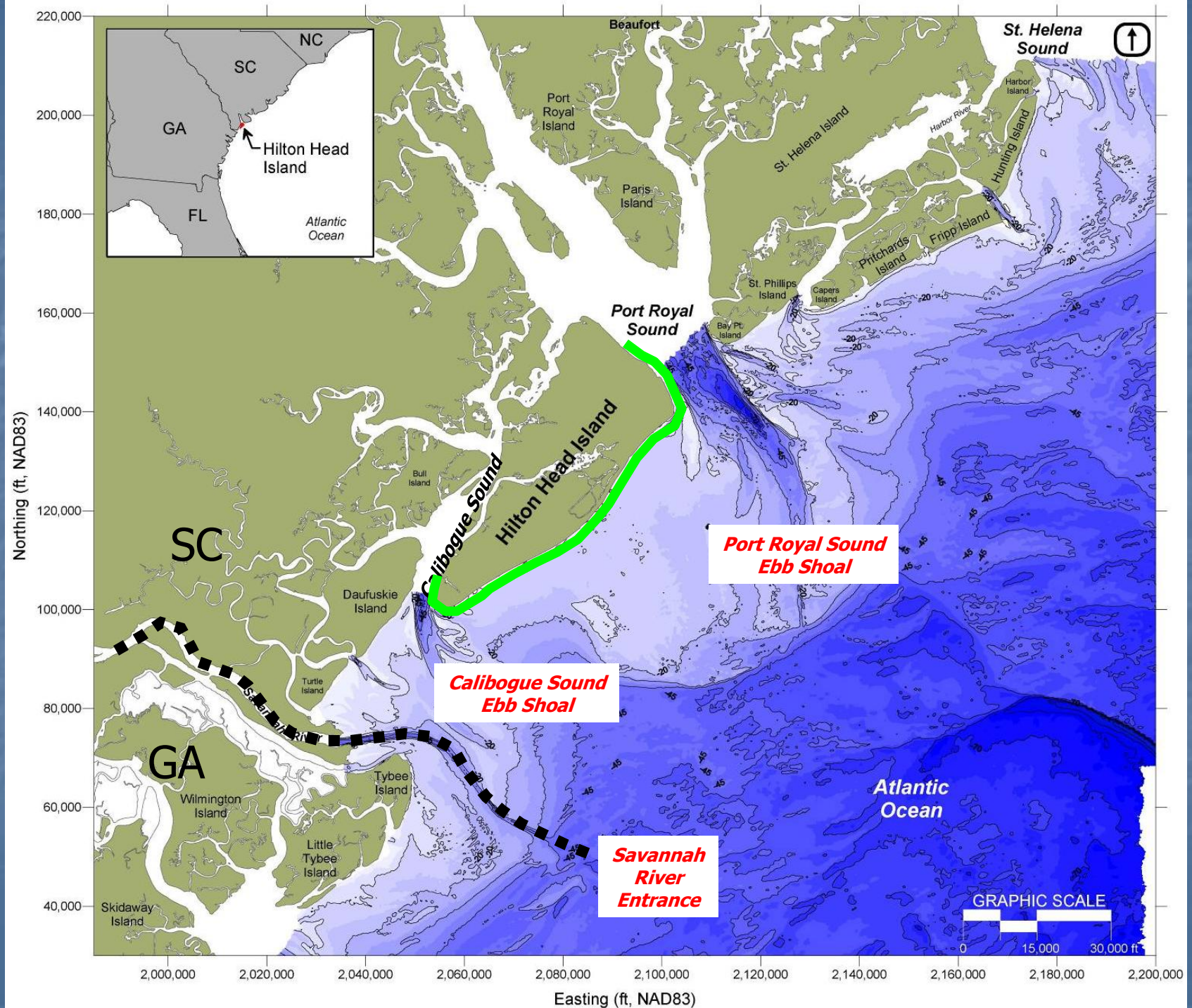




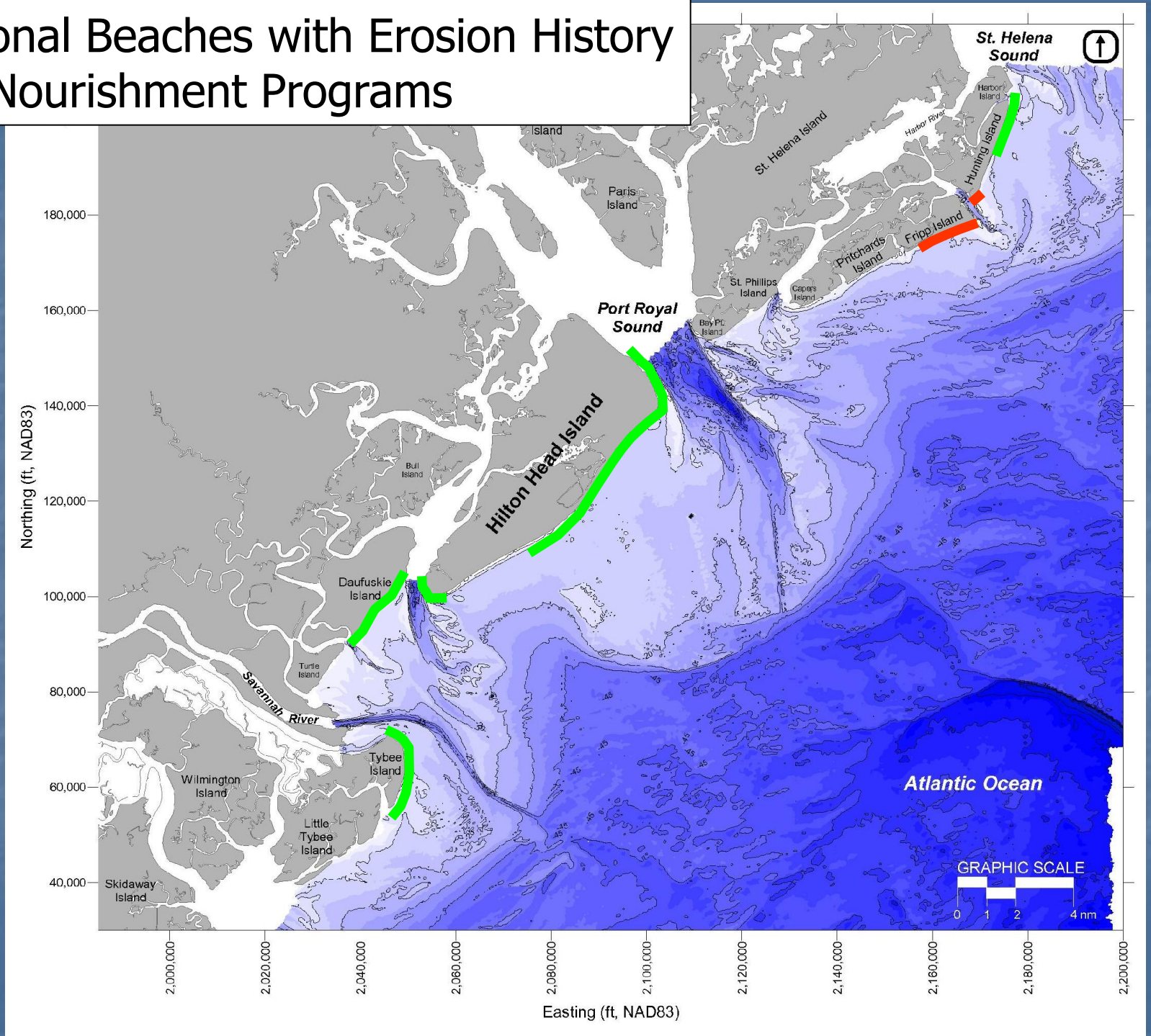
Christopher G. Creed, P.E.
olsen associates, inc.

Presentation Overview

- Brief Overview of Town's Beach Management Program
- Program Performance
- Past Investigations/Sand Sources
- Future Sand Resources
- Current Work


NC
SC
GA
FL
Hilton Head Island
Atlantic Ocean
Beaufort
Port Royal Island
Parris Island
St. Helena Island
St. Helena Sound
Harbor Island
Harbor River
Hunting Island
Fripp Island
Pritchards Island
St. Phillips Island
Capers Island
Bay Pt. Island
Port Royal Sound
Hilton Head Island
Calibogue Sound
Bull Island
Daufuskie Island
Turtle Island
Savannah River
Tybee Island
Wilmington Island
Little Tybee Island
Skidaway Island
SC
GA
Port Royal Sound Ebb Shoal
Calibogue Sound Ebb Shoal
Savannah River Entrance
Atlantic Ocean
GRAPHIC SCALE
0
15,000
30,000 ft
Northing (ft, NAD83)
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
Easting (ft, NAD83)
2,000,000
2,020,000
2,040,000
2,060,000
2,080,000
2,100,000
2,120,000
2,140,000
2,160,000
2,180,000
2,200,000

Regional Beaches with Erosion History and Nourishment Programs



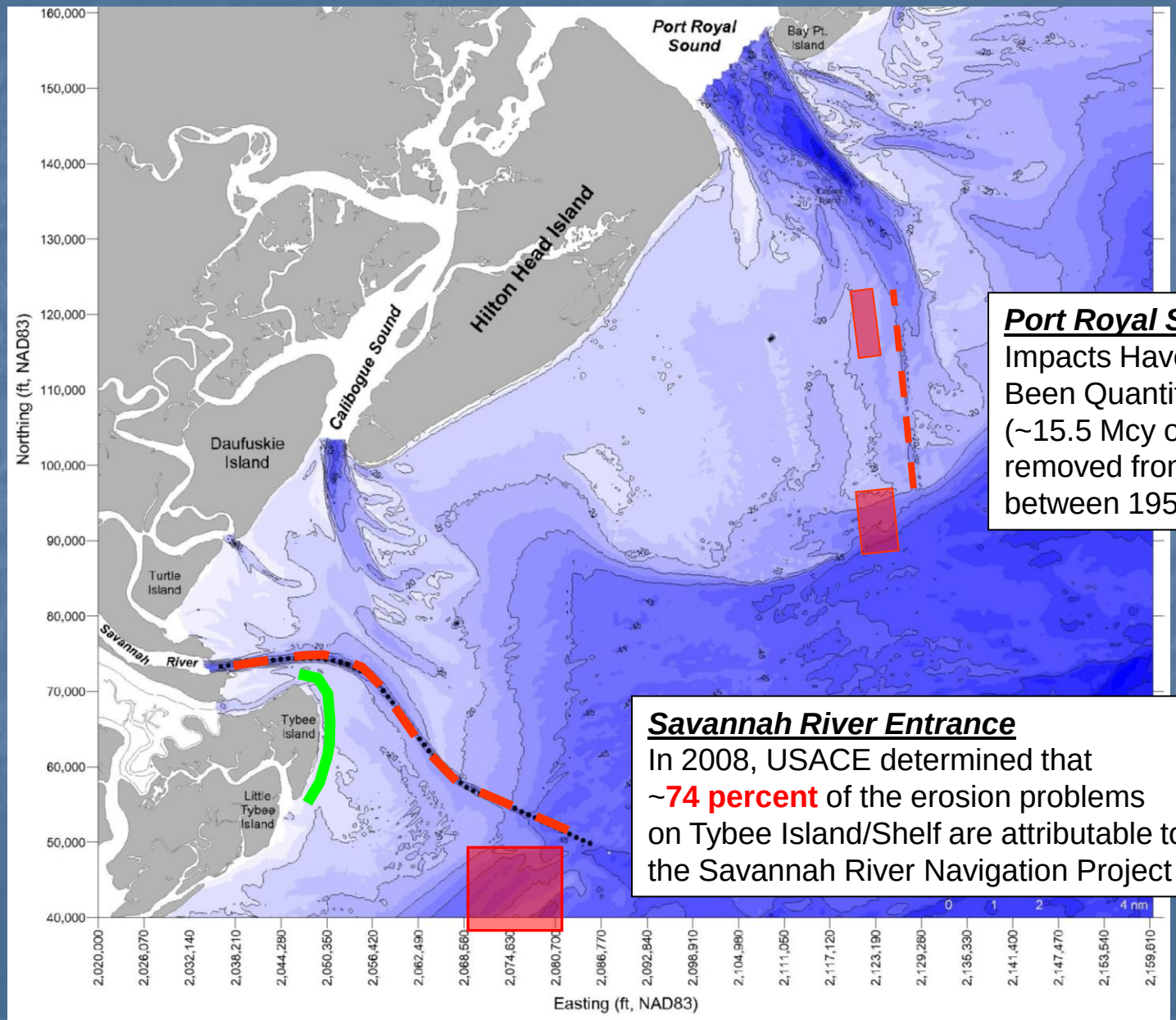
Recent History

- Island developed in late 1960's and early 1970's
- Incorporated as a Town in early 1980's

Mid-1980 Beach Conditions/Issues

- Areas of Highly Erosional Shoreline
- Chronic Sediment Deficit (northern 2/3)
- Need for Comprehensive Protection of Upland
- Minimal Dry Beach
  (over 9,000 feet of oceanfront armoring)
- Potential Federal navigation project impacts from Port Royal Sound (PRS)

Effects of Federal Channels



Port Royal Sound
Impacts Have Not Been Quantified (~15.5 Mcy of sand removed from system between 1956 and 2002)

Savannah River Entrance
In 2008, USACE determined that ~**74 percent** of the erosion problems on Tybee Island/Shelf are attributable to the Savannah River Navigation Project

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Mid-1980 Beach Conditions

Early Planning

- Incorporated Town immediately identified the need for a beach management strategy
- 1986 - Shore Protection Task Group was created
- Semi-annual beach monitoring initiated

Alternatives for Long-Term Strategy (1986)

- No Action
- Encourage Individuals to Protect Themselves (walls, limited sand placement, etc.)
- Restore and Maintain Beach with Comprehensive Approach

Precepts of Approach

- Comprehensive Beach Monitoring
  - Island-wide semi-annual surveys/annual analysis reports
- Comprehensive Beach Restoration
- Strategic use of shore stabilizing structures to improve performance/increase longevity of beach nourishment
- Use of near-island, economically feasible sand sources
- Attempt to control seaward advancement of development and protect beach/dune resources

Hilton Head Island Beach Project History

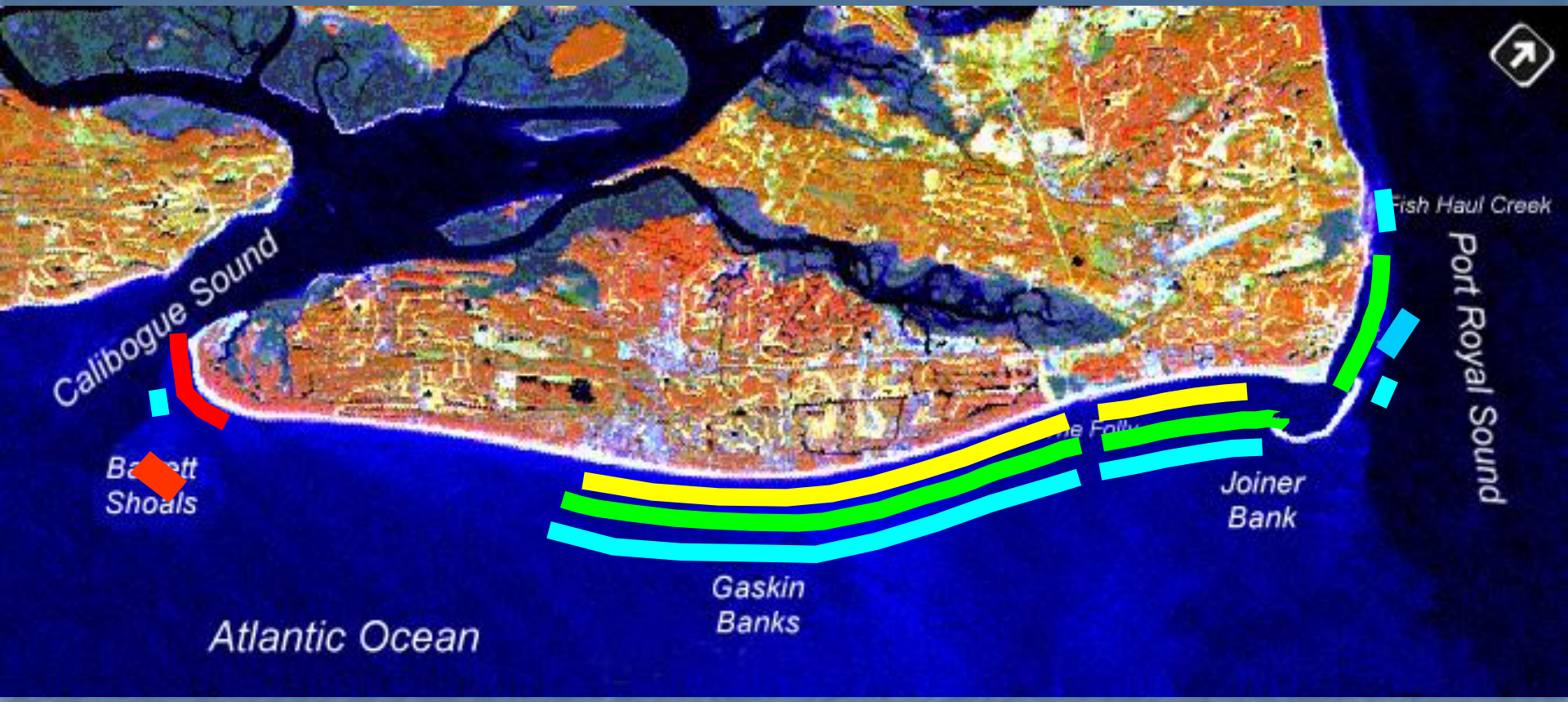
1990 - Initial Restoration of Atlantic Shorefront

1997 - Renourishment of Atlantic Shorefront
- Channel Relocation (Port Royal Plantation)
- Restoration of a Portion of the Port Royal Shoreline

1999 - South Beach Emergency Beach Fill Project

2006/07 – Renourishment of Atlantic Shorefront
- Renourishment of Port Royal Plantation
- Renourishment of South Beach
- Restoration of Fish Haul/Spa
- Six Detached Breakwaters at the Folly

Project History



1990 – Atlantic Restoration

1997 – Atlantic Renourishment/Port Royal Restoration / Channel Relocation

1999 – South Beach Restoration

2006/07-Atlantic-Port Royal-South Beach Renourishment / Fish Haul Restoration

1989 (Typical low tide condition at North Forest Beach.)

2001

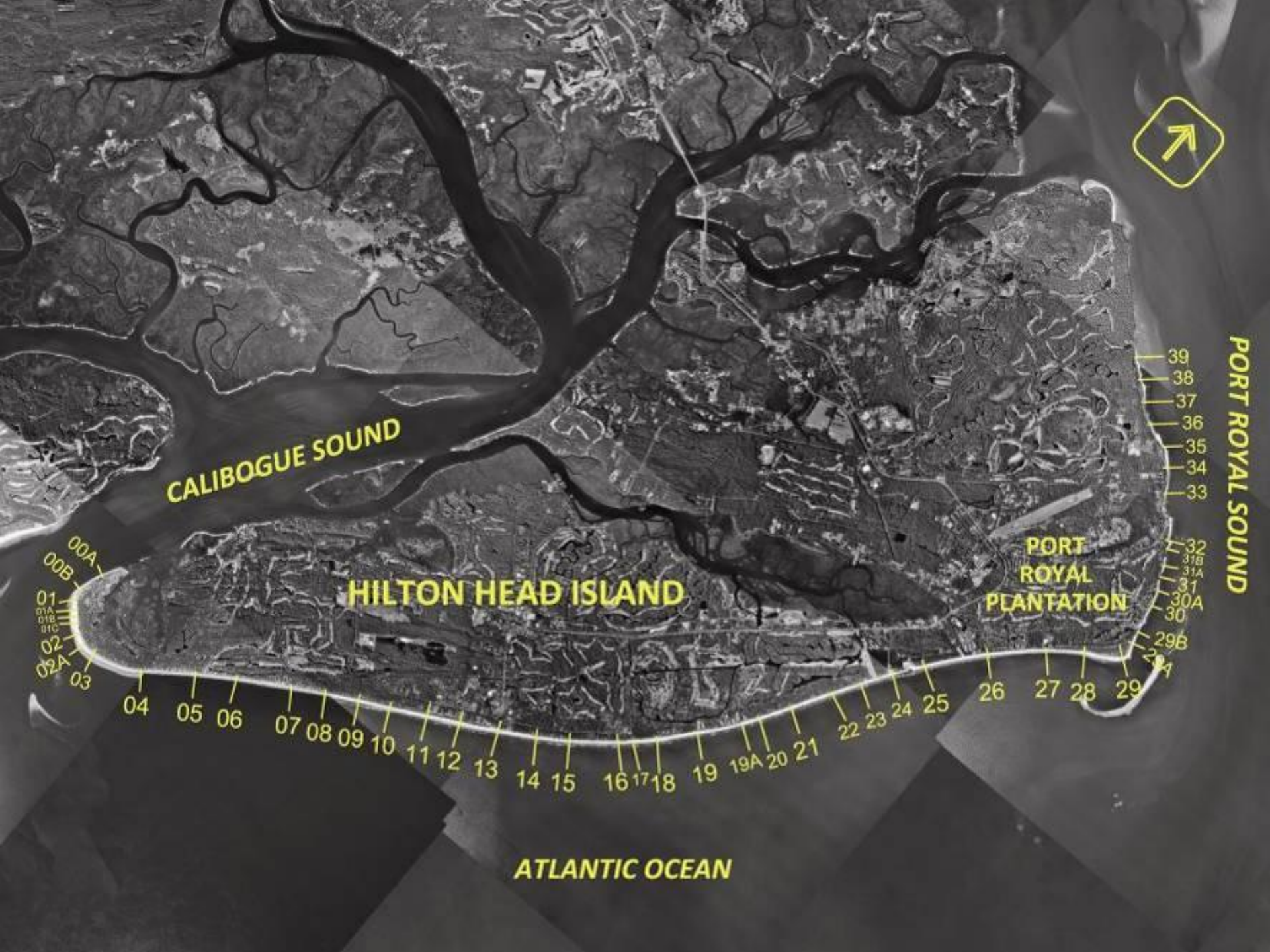

9,000 ft Rock Revetment (pre-1990)
2006

To-date Beach Project Summary

- Approx. 7.5 Mcy placed
- Approx. 5.5 Mcy remain in the beach system
- Atlantic shorefront is ~200 wider, on average, than pre-1990 conditions
- Construction Cost To-Date ~ $ 35 Million
- Value of First Tier Shorefront ~ $ 3 Billion

Beach Monitoring

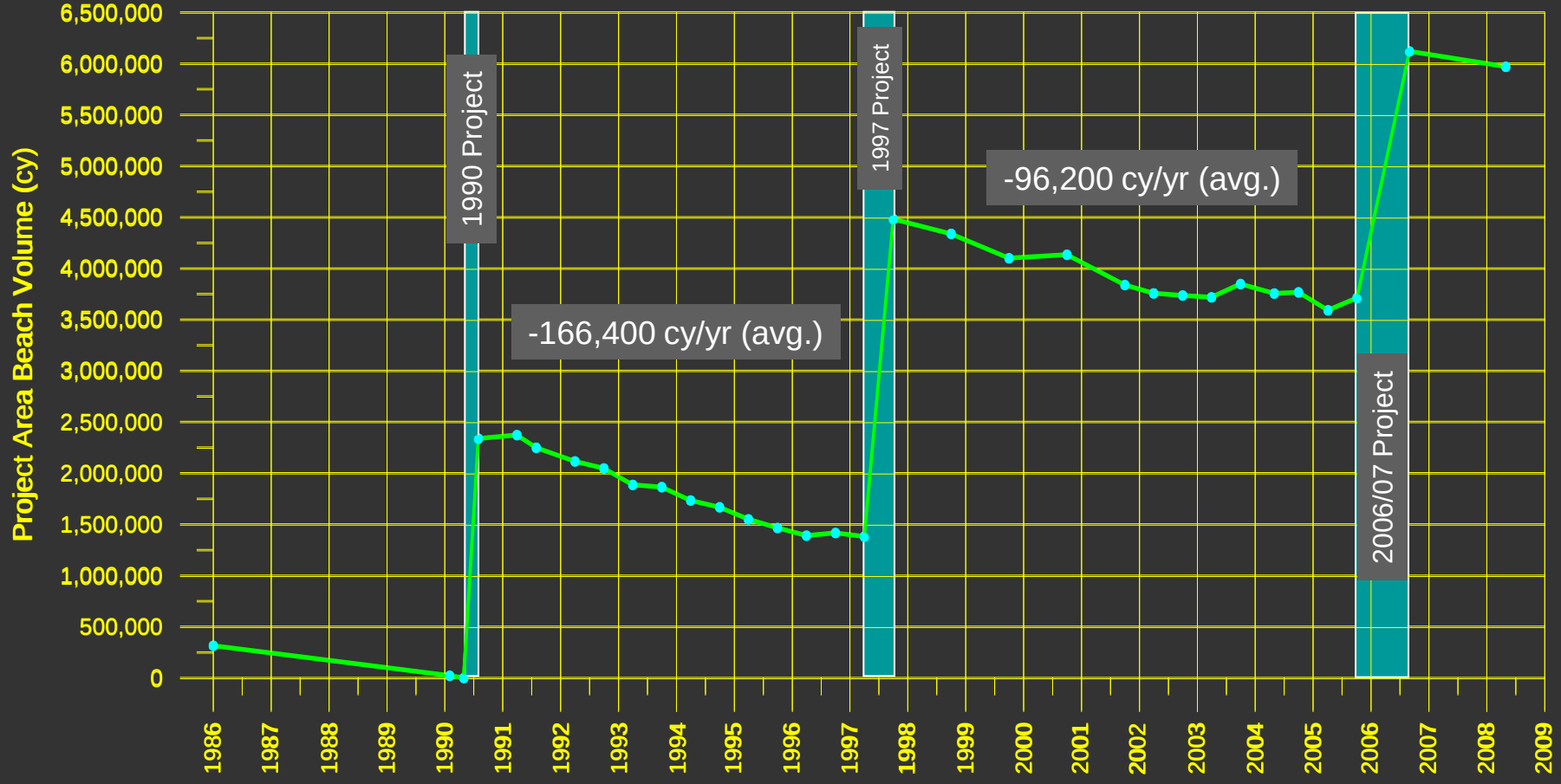
- Island-wide Beach Monitoring Program
  - 51 Beach Monitoring Stations (32 original)
  - Semi-annual survey data dating back to 1986
  - Annual Aerial Photography
- Overall Beach Conditions
  - Shoreline position/change rates
  - Beach volume status/change rates
- Comprehensive Project Planning


CALIBOGUE SOUND
HILTON HEAD ISLAND
PORT ROYAL PLANTATION
PORT ROYAL SOUND
ATLANTIC OCEAN
00A
00B
01
01A
01B
01C
02
02A
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
19A
20
21
22
23
24
25
26
27
28
29
29B
30
30A
31
31A
31B
32
33
34
35
36
37
38
39

Program Performance

- Highly Successful Program
- Performance of nourishment projects have far exceeded program expectations

Cumulative Beach Volume Change
Hilton Head Island Beach Nourishment – Atlantic Ocean Project Shoreline
(1986-2008)



Pre-Project Performance Prediction (1988) = ~ -164,000 cy/yr (avg.)

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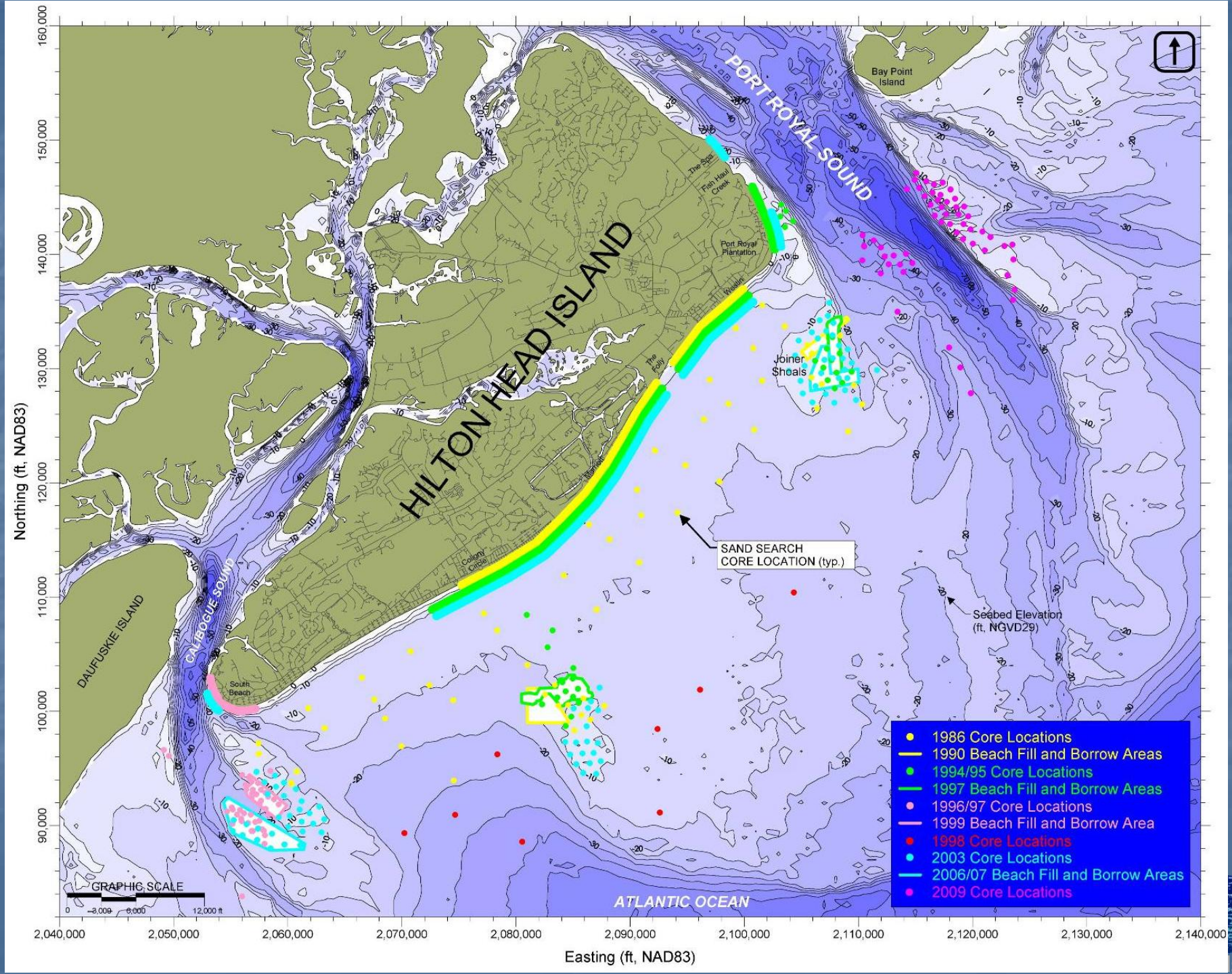
Sand Source – Selection Criteria

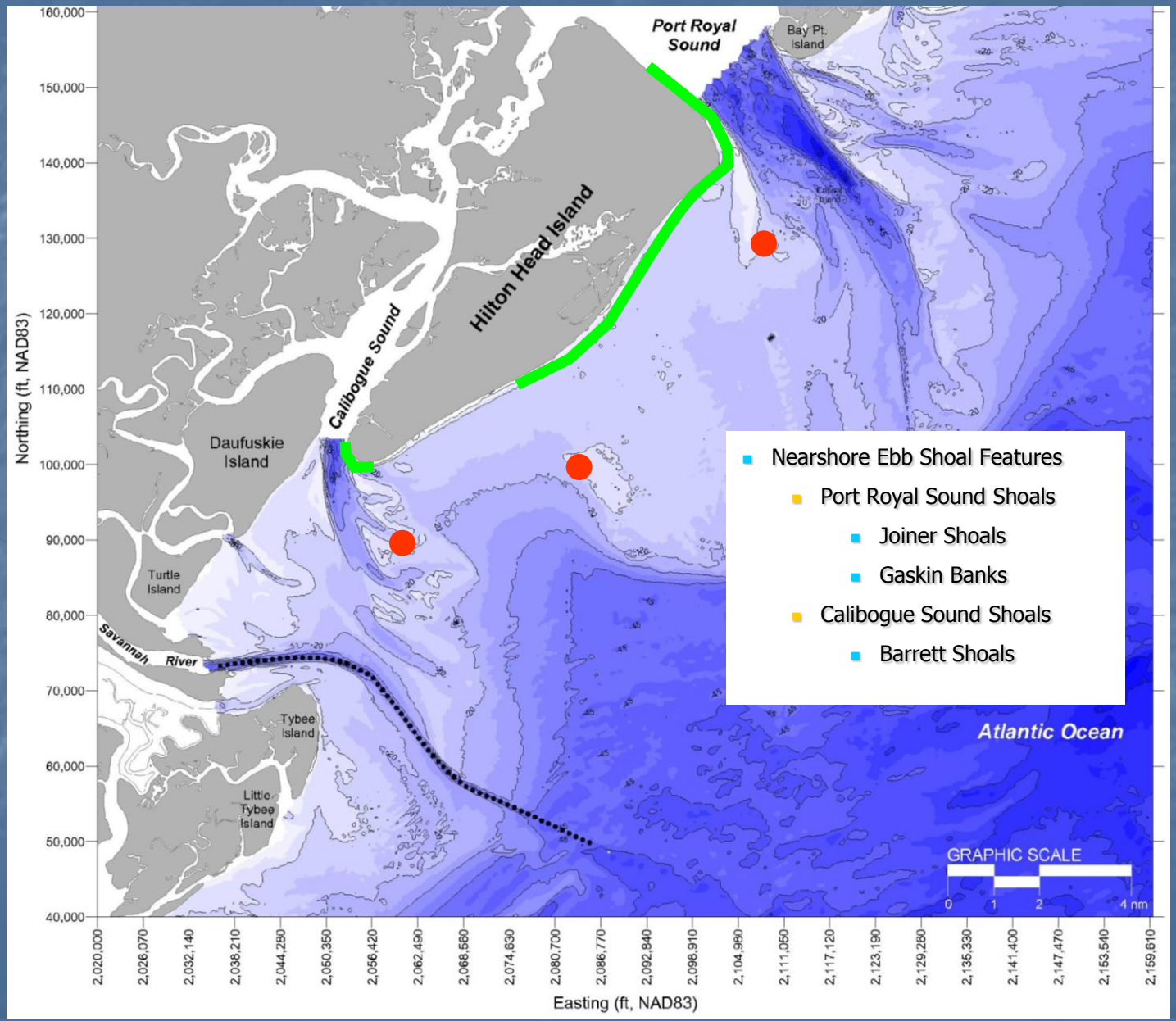
- Beach Compatibility
  - D_{50}, GSD , percent fines 1-3%, shell content, color
  - Performance
  - Environmental
- Reasonable Distance from Project Shoreline(s)
  - <2 nm offshore for hydraulic cutter-suction dredges
- Accessible by Dredge
- Dredge-able Sand Deposits (i.e., sufficient thickness)
- Avoid the Creation of Seabed Depressions
- Protected Areas
  - Seasonal Dredging Constraints

Past Investigations

- 1988 – 60 Vibracores (20-ft), Limited Seismic
- 1993 – Surface Sampling in PRS Entrance Channel
- 1994 – Comprehensive CHIRP Survey (Calibogue to PR Sound), 30 Vibracores)
- 1995 – Surface Sampling in PRS Outer Entrance Channel
- 1998 – MMS Study (8 cores offshore of HHI in Federal Waters)
- 1996/97 – Barrett Shoals Vibracores (20-ft) (ATM)
- 2004 - 60 Vibracores (20-ft)
- 2008
  - Detailed Hydro Survey of PRS
  - Sub-bottom Survey PRS Ebb Tidal Shoal Features
  - 60 Vibracores (20-ft)

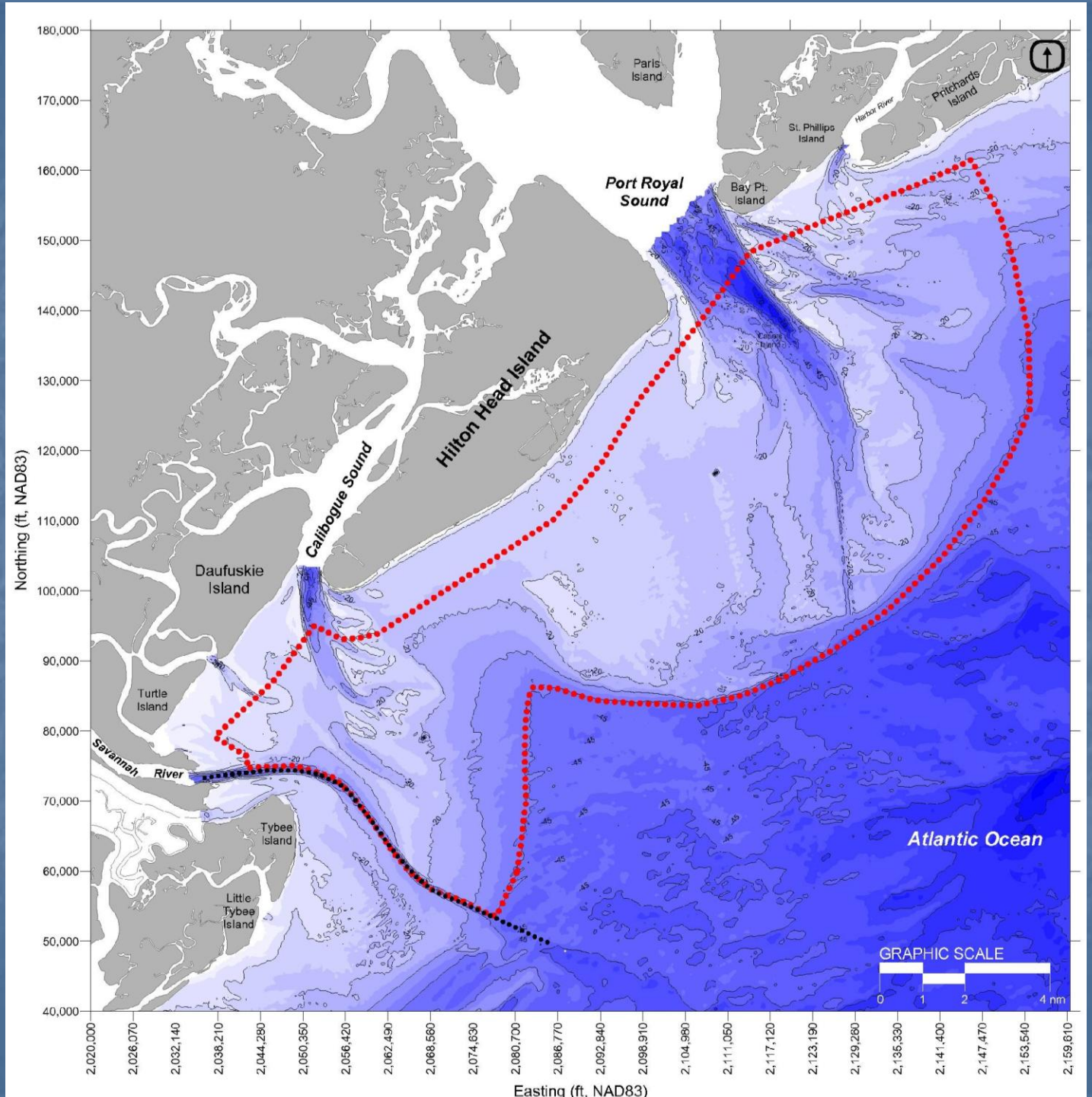

HILTON HEAD ISLAND
PORT ROYAL SOUND
Bay Point Island
DAUFUSKIE ISLAND
CALIBOGUE SOUND
South Beach
Joiner Shoals
SAND SEARCH CORE LOCATION (typ.)
Seabed Elevation (ft, NGVD29)
ATLANTIC OCEAN
GRAPHIC SCALE
0 3,000 6,000 12,000 ft
1986 Core Locations
1990 Beach Fill and Borrow Areas
1994/95 Core Locations
1997 Beach Fill and Borrow Areas
1996/97 Core Locations
1999 Beach Fill and Borrow Area
1998 Core Locations
2003 Core Locations
2006/07 Beach Fill and Borrow Areas
2009 Core Locations
Northing (ft, NAD83)
160,000
150,000
140,000
130,000
120,000
110,000
100,000
90,000
Easting (ft, NAD83)
2,040,000
2,050,000
2,060,000
2,070,000
2,080,000
2,090,000
2,100,000
2,110,000
2,120,000
2,130,000
2,140,000

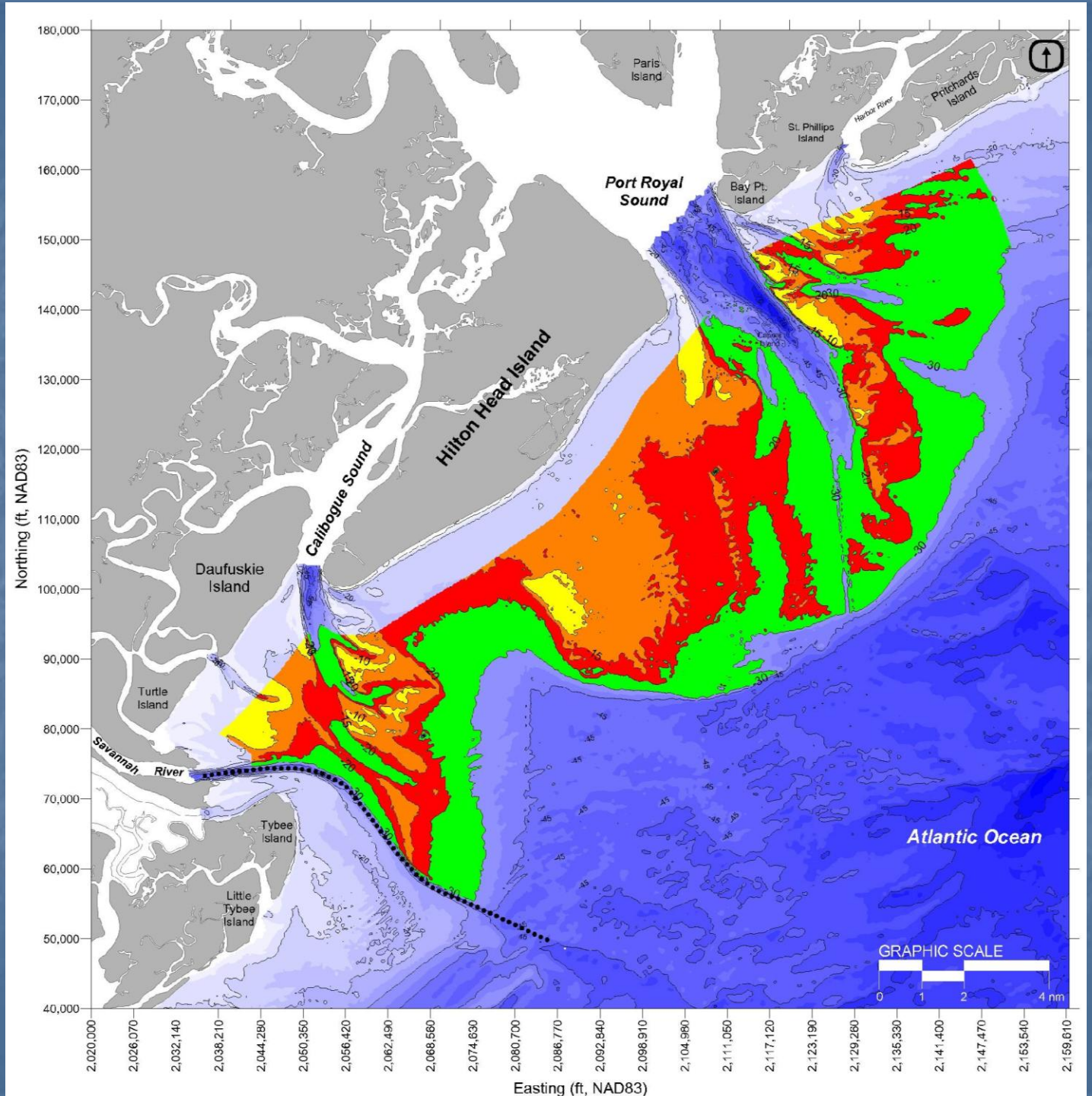
Past Sand Sources



Potential Future Sand Sources

- Nearshore Shoals Fields
  - Calibogue Sound Shoals
  - Port Royal Sound Shoals (Gaskins Banks, North Side Shoals)


Paris Island
St. Phillips Island
Harbor River
Pritchards Island
Port Royal Sound
Bay Pt. Island
Hilton Head Island
Calibogue Sound
Daufuskie Island
Turtle Island
Savannah River
Tybee Island
Little Tybee Island
Atlantic Ocean
GRAPHIC SCALE
0 1 2 4 nm
Northing (ft, NAD83)
Easting (ft, NAD83)
180,000
170,000
160,000
150,000
140,000
130,000
120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
2,020,000
2,026,070
2,032,140
2,038,210
2,044,280
2,050,350
2,056,420
2,062,490
2,068,560
2,074,630
2,080,700
2,086,770
2,092,840
2,098,910
2,104,980
2,111,050
2,117,120
2,123,190
2,129,260
2,135,330
2,141,400
2,147,470
2,153,540
2,159,610


Paris Island
Pritchards Island
St. Phillips Island
Harbor River
Port Royal Sound
Bay Pt. Island
Hilton Head Island
Calibogue Sound
Daufuskie Island
Turtle Island
Savannah River
Tybee Island
Little Tybee Island
Atlantic Ocean
GRAPHIC SCALE
0 1 2 4 nm
Northing (ft, NAD83)
Easting (ft, NAD83)
180,000
170,000
160,000
150,000
140,000
130,000
120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
2,020,000
2,026,070
2,032,140
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2,068,560
2,074,630
2,080,700
2,086,770
2,092,840
2,098,910
2,104,980
2,111,050
2,117,120
2,123,190
2,129,260
2,135,330
2,141,400
2,147,470
2,153,540
2,159,610

Ebb Shoal Volumes

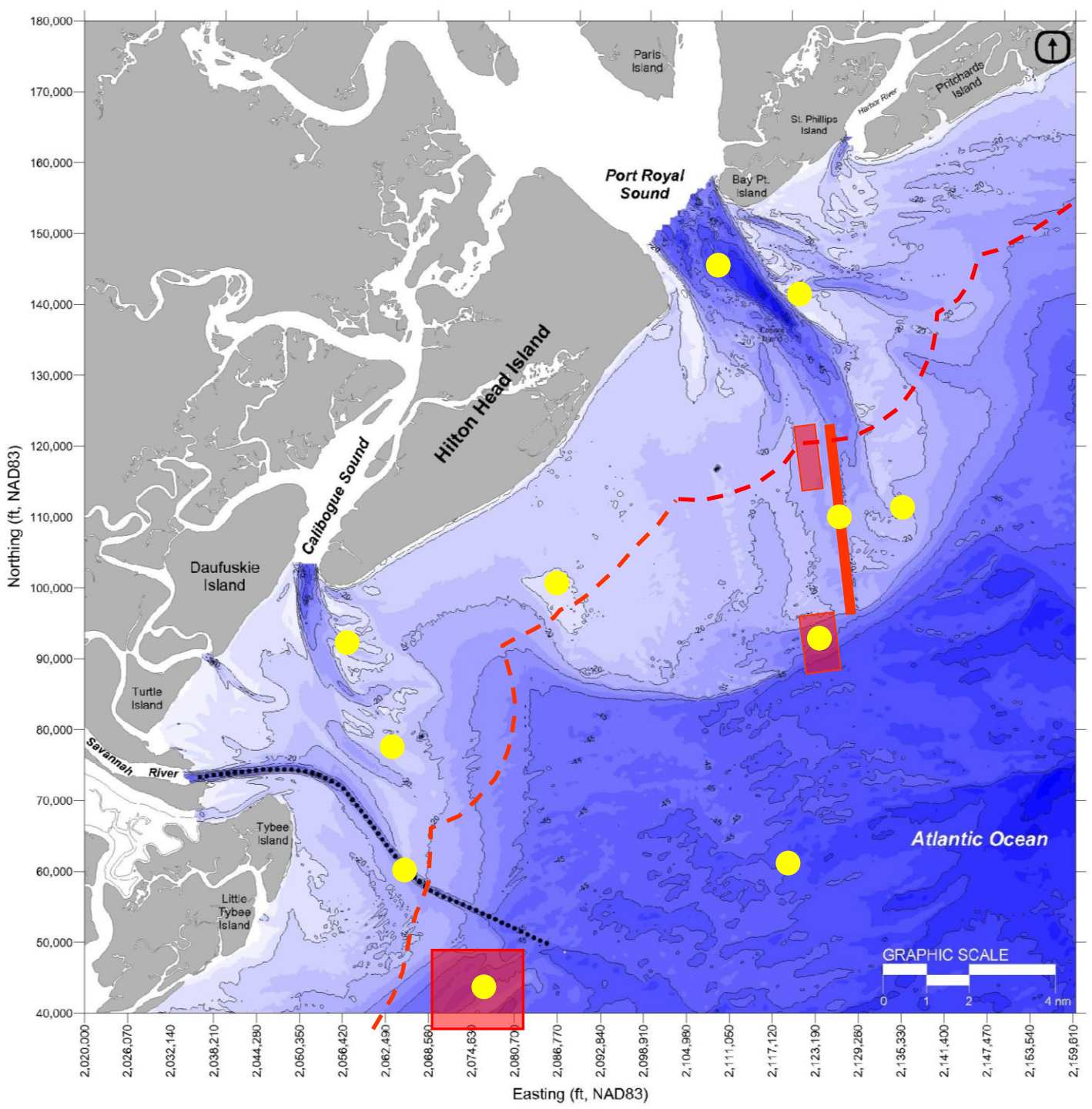
(Beyond 1 nm offshore)
(Not ALL Material is Beach Compatible Sand)

Elevation (ft - NGVD)	Volume above Elevation (cy)		
	Port Royal Sound Ebb Shoal	Calibogue Sound Ebb Shoal (north of SRE)	Total
0	1,000	0	1,000
-5	562,000	6,000	568,000
-10	10,303,000	6,236,000	16,539,000
-15	89,665,000	37,434,000	127,099,000
-20	326,423,000	111,625,000	438,048,000
-25	710,948,000	232,391,000	943,339,000
-30	1,207,387,000	391,191,000	1,598,578,000

Approximately 7.5 Mcy (~1.7% of total volume) dredged from ebb shoals and placed along island beaches with in the littoral zone

Potential Future Sand Sources

- Nearshore Ebb Tidal Shoals (>1nm from shore)
  - Calibogue Sound Shoals
  - Port Royal Sound (PRS) Shoals (Gaskins Banks, North Side Shoals)
- Outer Ebb Tidal Shoals
  - Port Royal Sound Entrance Cut (Beneficial Use)
  - Savannah River Entrance Cut (Beneficial Use)
  - Federal Resources (MMS Lease Issues)
- Inlet Channel(s)
- ODMDS
  - ~15.5 Mcy Removed from PRS Ebb Shoal and placed in ODMDS


Paris Island
Pritchards Island
Harbor River
St. Phillips Island
Port Royal Sound
Bay Pt. Island
Hilton Head Island
Calibogue Sound
Daufuskie Island
Turtle Island
Savannah River
Tybee Island
Little Tybee Island
Atlantic Ocean
GRAPHIC SCALE
0
1
2
4 nm
Northing (ft, NAD83)
180,000
170,000
160,000
150,000
140,000
130,000
120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
Easting (ft, NAD83)
2,020,000
2,026,070
2,032,140
2,038,210
2,044,280
2,050,350
2,056,420
2,062,490
2,068,560
2,074,630
2,080,700
2,086,770
2,092,840
2,098,910
2,104,980
2,111,050
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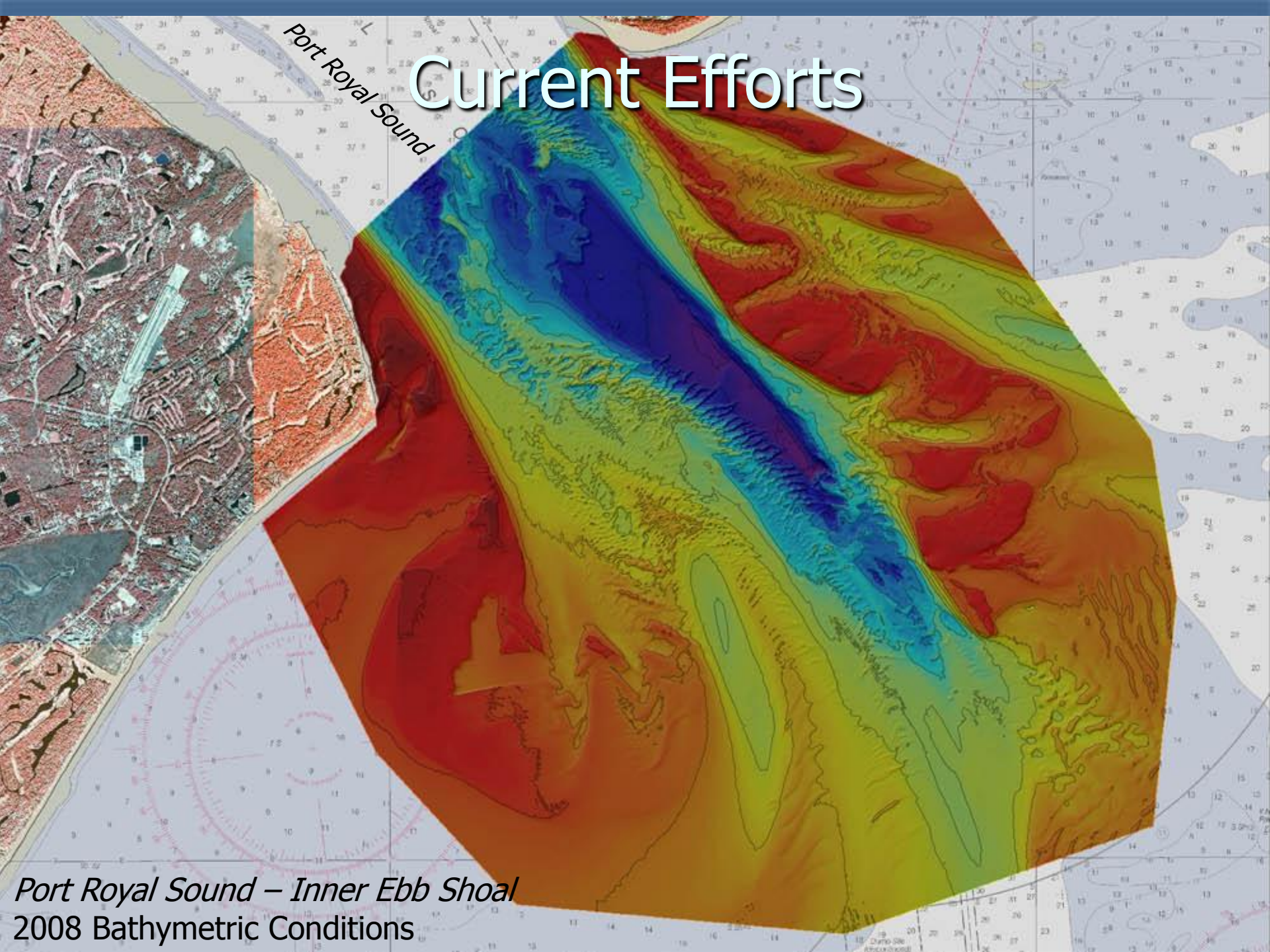
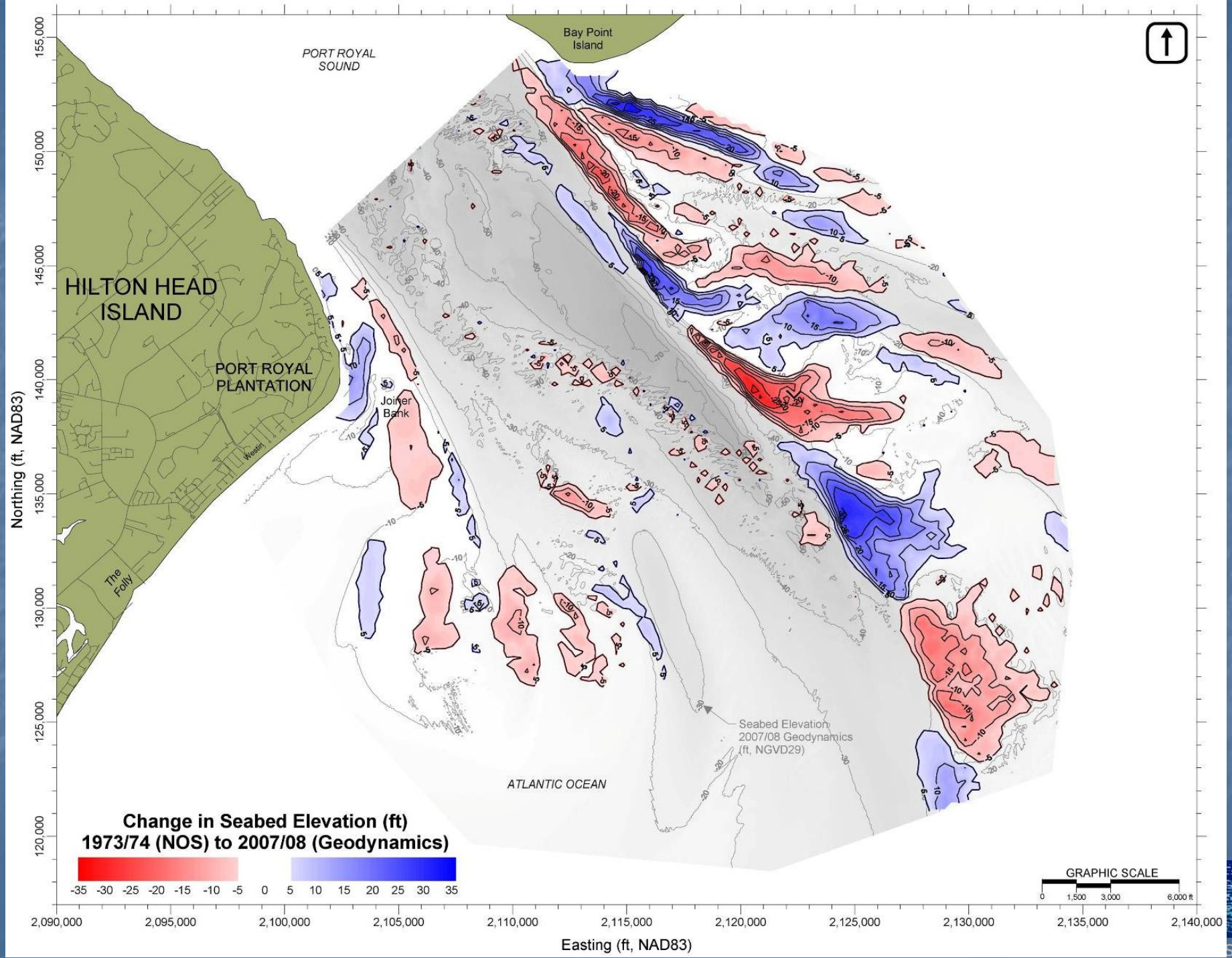
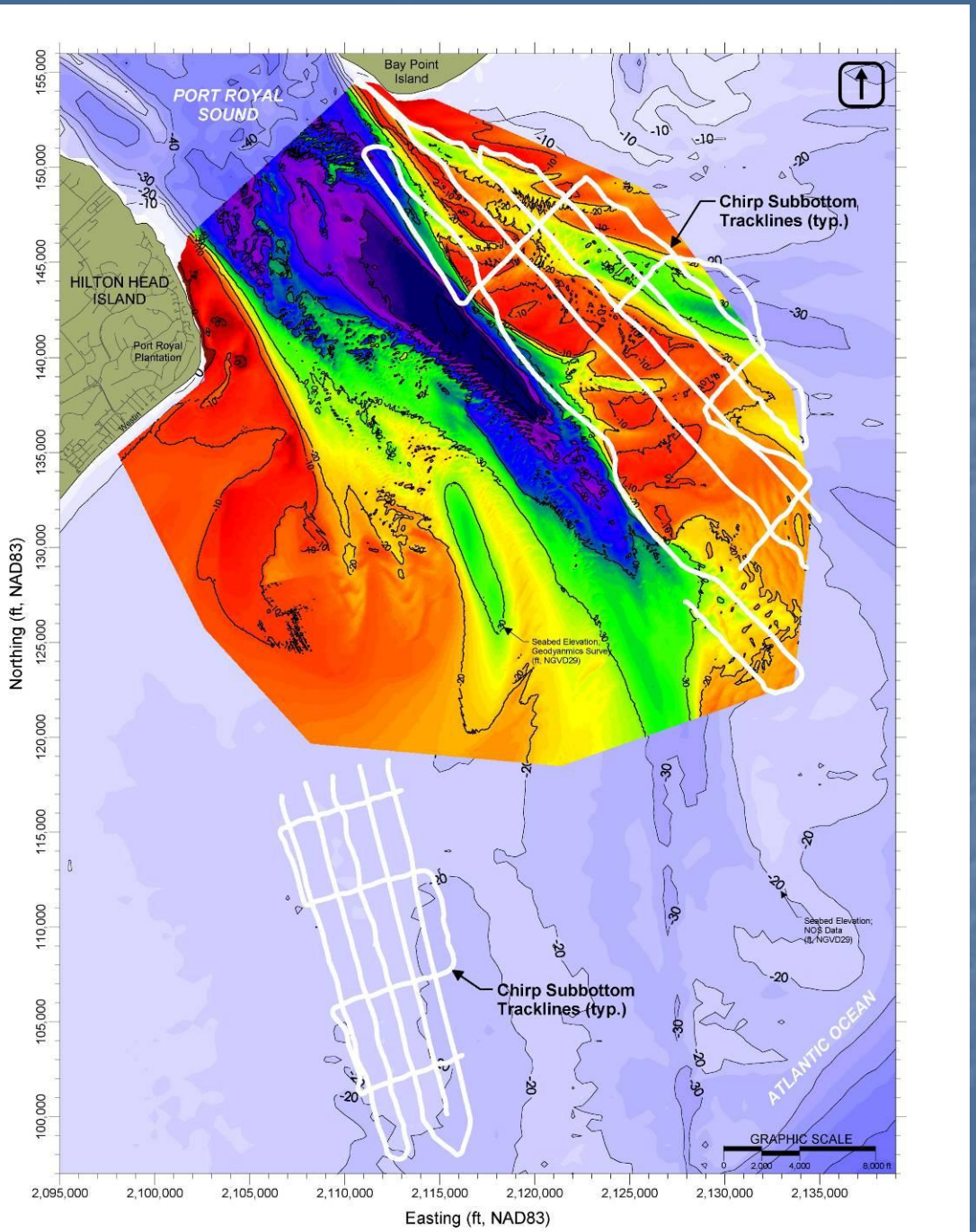
2,129,260
2,135,330
2,141,400
2,147,470
2,153,540
2,159,610

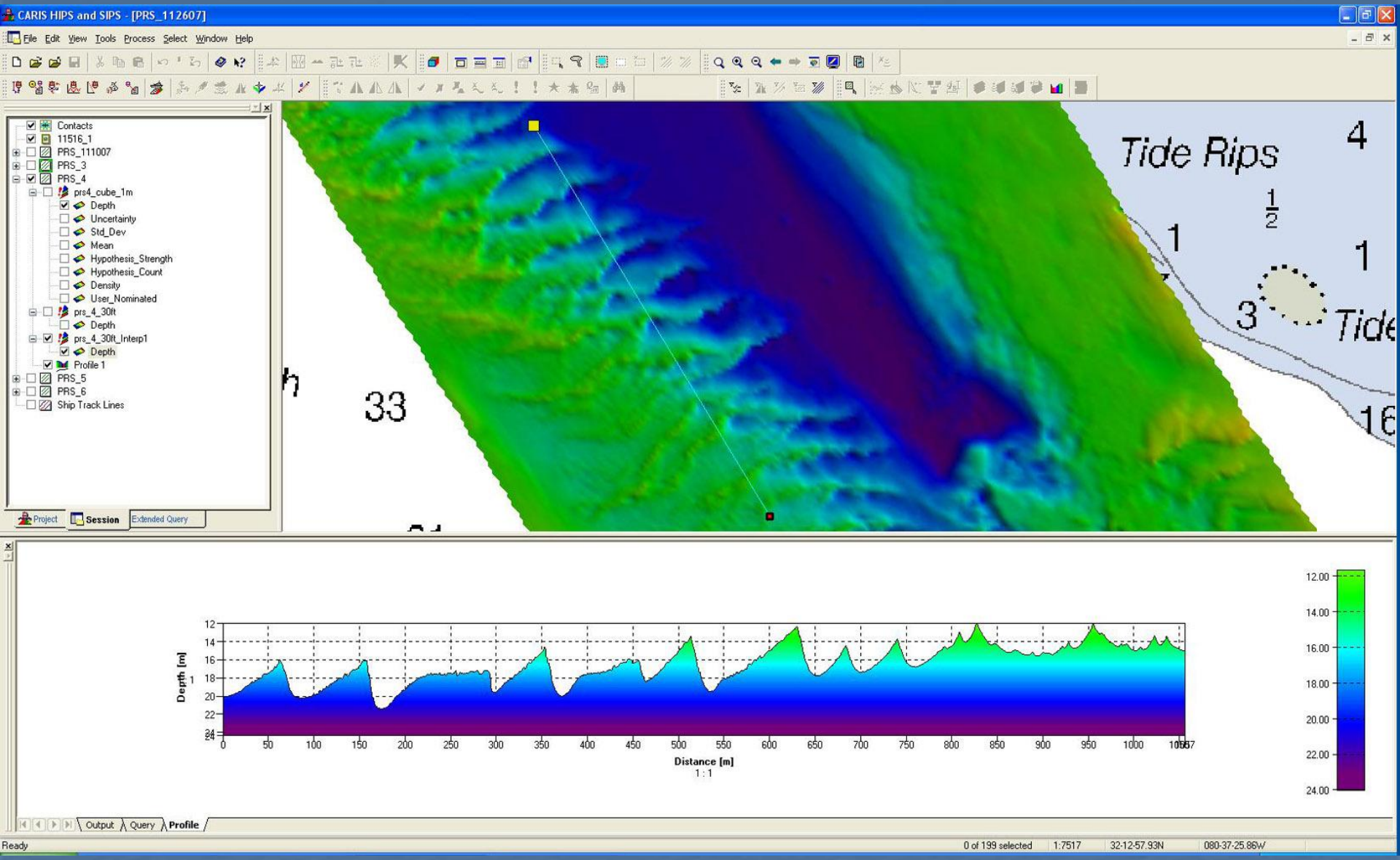
Current Efforts



Port Royal Sound – Inner Ebb Shoal
2008 Bathymetric Conditions


Bay Point Island
PORT ROYAL SOUND
HILTON HEAD ISLAND
PORT ROYAL PLANTATION
Joiner Bank
The Folly
ATLANTIC OCEAN
Seabed Elevation 2007/08 Geodynamics (ft, NGVD29)
Change in Seabed Elevation (ft)
1973/74 (NOS) to 2007/08 (Geodynamics)
-35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35
GRAPHIC SCALE
0 1,500 3,000 6,000 ft
Northing (ft, NAD83)
155,000
150,000
145,000
140,000
135,000
130,000
125,000
120,000
Easting (ft, NAD83)
2,090,000
2,095,000
2,100,000
2,105,000
2,110,000
2,115,000
2,120,000
2,125,000
2,130,000
2,135,000
2,140,000


Bay Point Island
PORT ROYAL SOUND
HILTON HEAD ISLAND
Port Royal Plantation
Chirp Subbottom Tracklines (typ.)
Seabed Elevation; Geodyanmics Survey (ft, NGVD29)
Seabed Elevation; NOS Data (ft, NGVD29)
Chirp Subbottom Tracklines (typ.)
ATLANTIC OCEAN
GRAPHIC SCALE
0 2,000 4,000 8,000 ft
Northing (ft, NAD83)
155,000
150,000
145,000
140,000
135,000
130,000
125,000
120,000
115,000
110,000
105,000
100,000
Easting (ft, NAD83)
2,095,000
2,100,000
2,105,000
2,110,000
2,115,000
2,120,000
2,125,000
2,130,000
2,135,000


CARIS HIPS and SIPS - [PRS_112607]
File Edit View Tools Process Select Window Help
Contacts
11516_1
PRS_111007
PRS_3
PRS_4
prs4_cube_1m
Depth
Uncertainty
Std_Dev
Mean
Hypothesis_Strength
Hypothesis_Count
Density
User_Nominated
prs_4_30ft
Depth
prs_4_30ft_Interp1
Depth
Profile 1
PRS_5
PRS_6
Ship Track Lines
Project
Session
Extended Query
Tide Rips
33
Depth [m]
Distance [m]
1 : 1
Output
Query
Profile
Ready
0 of 199 selected
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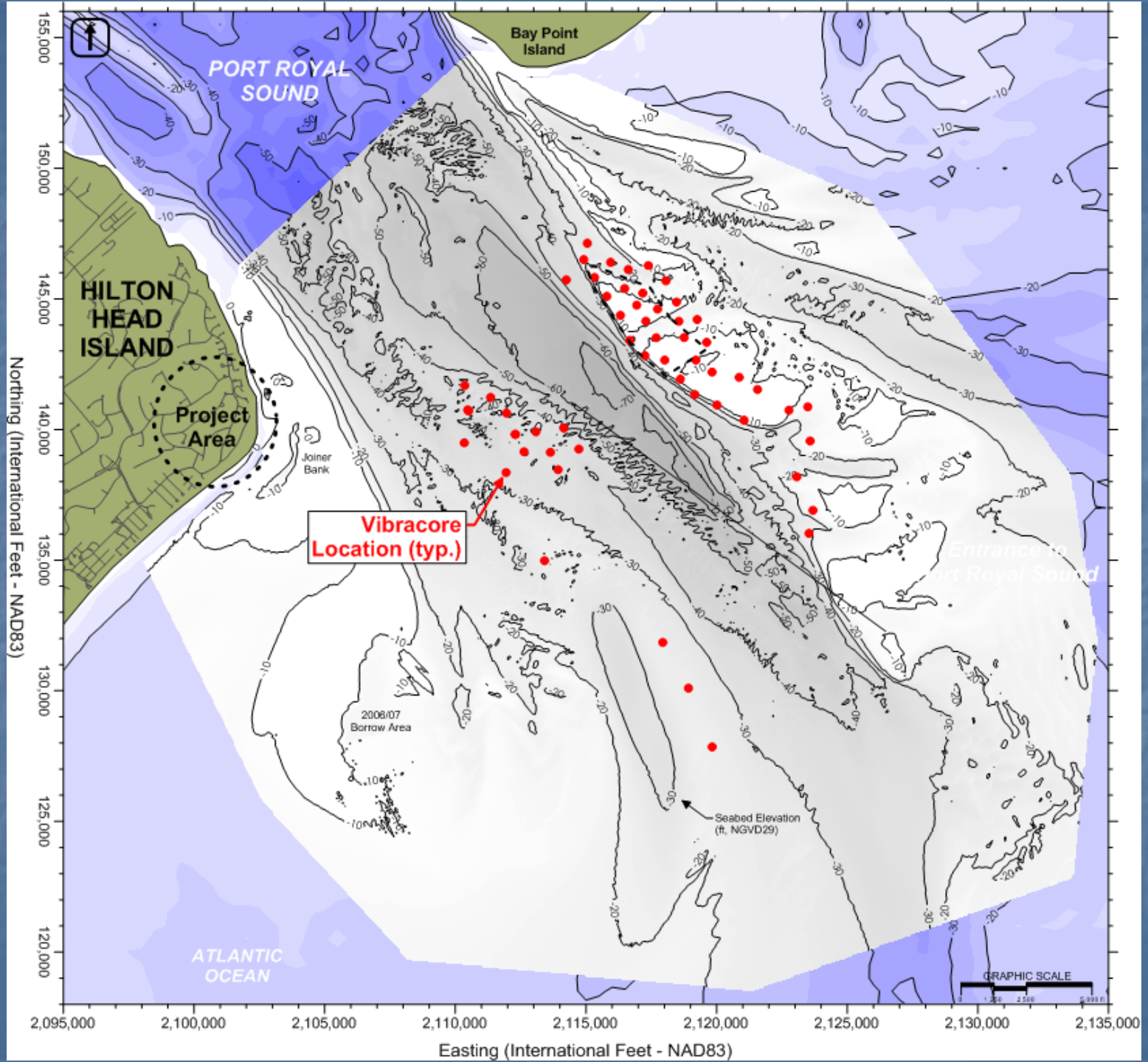
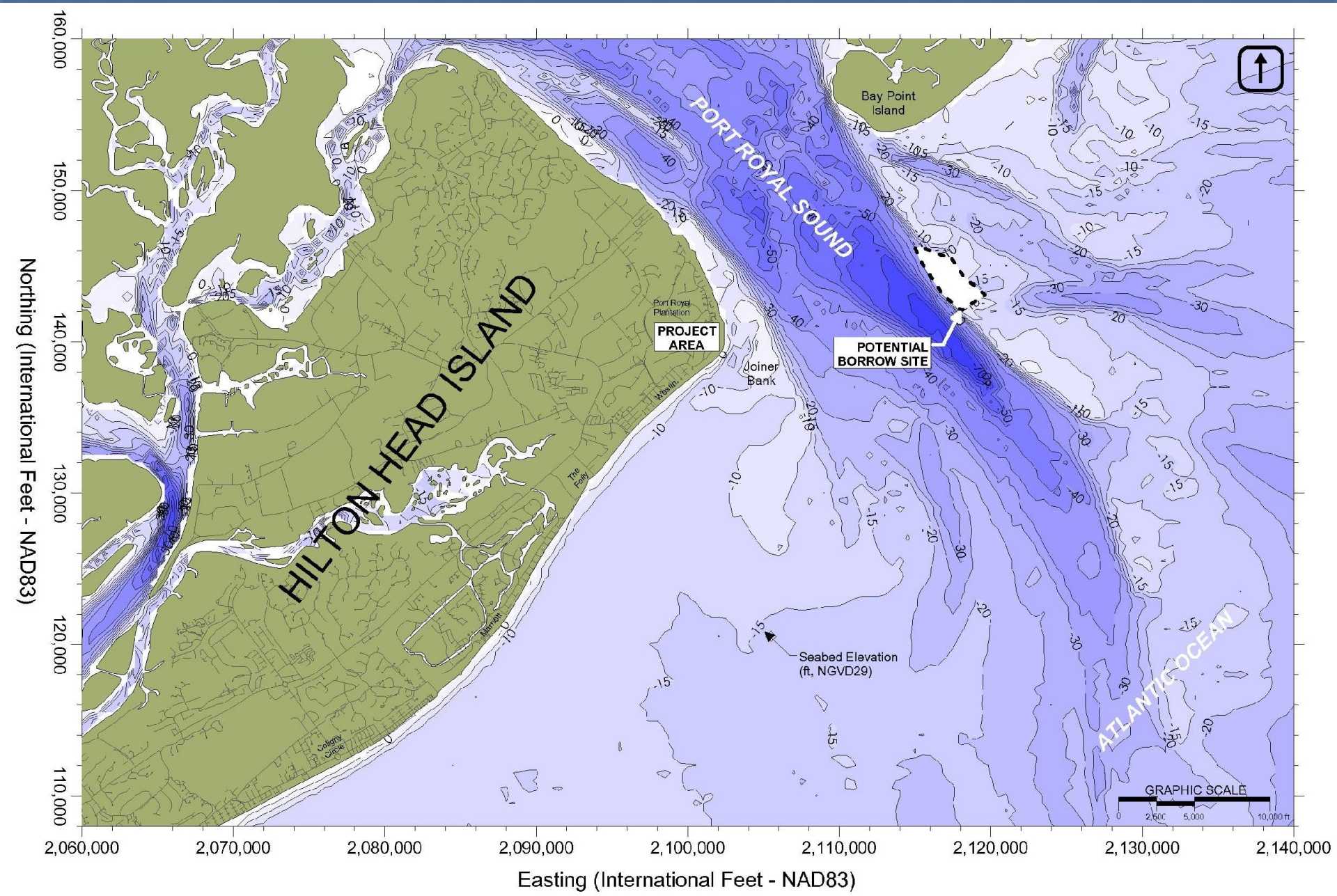
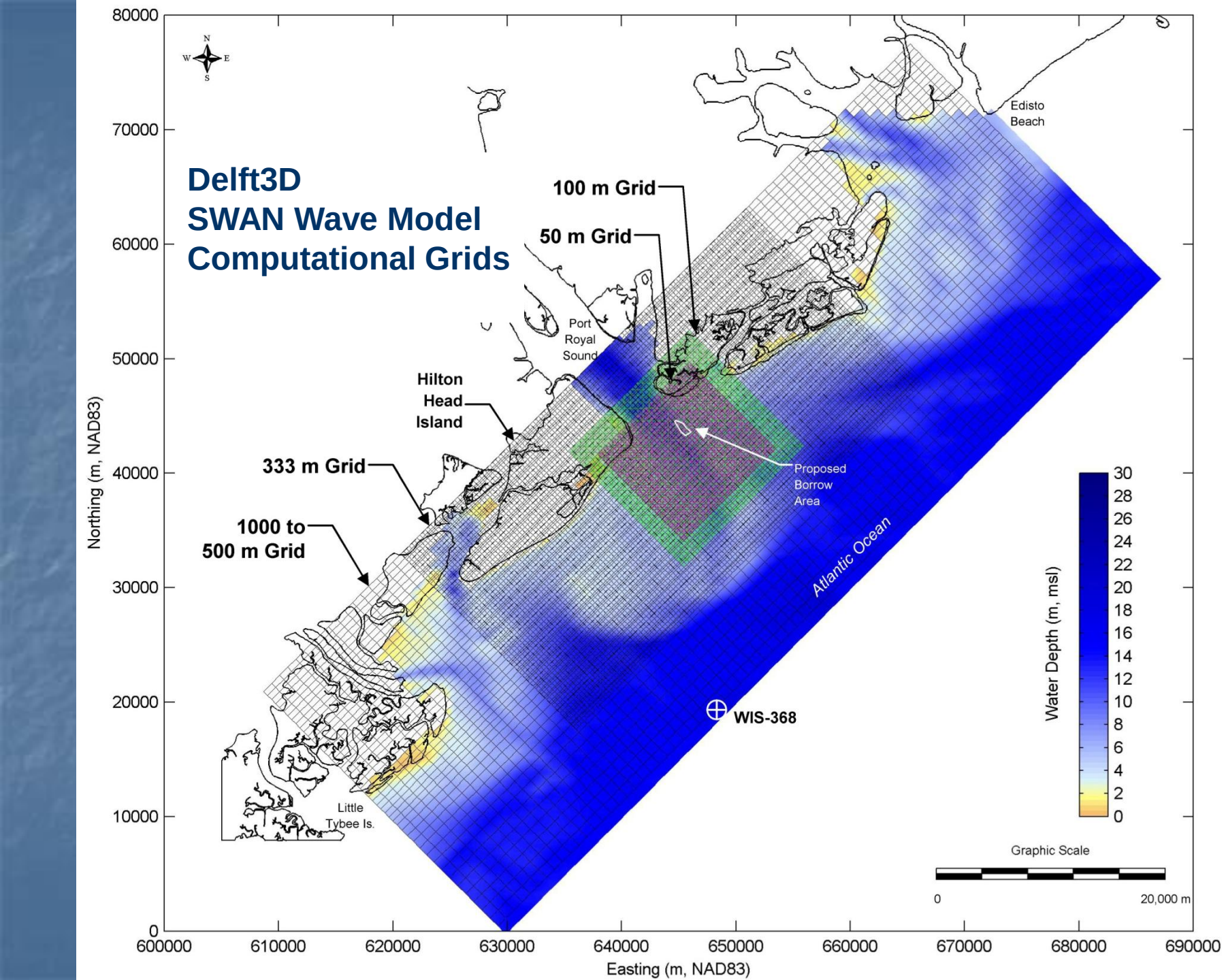
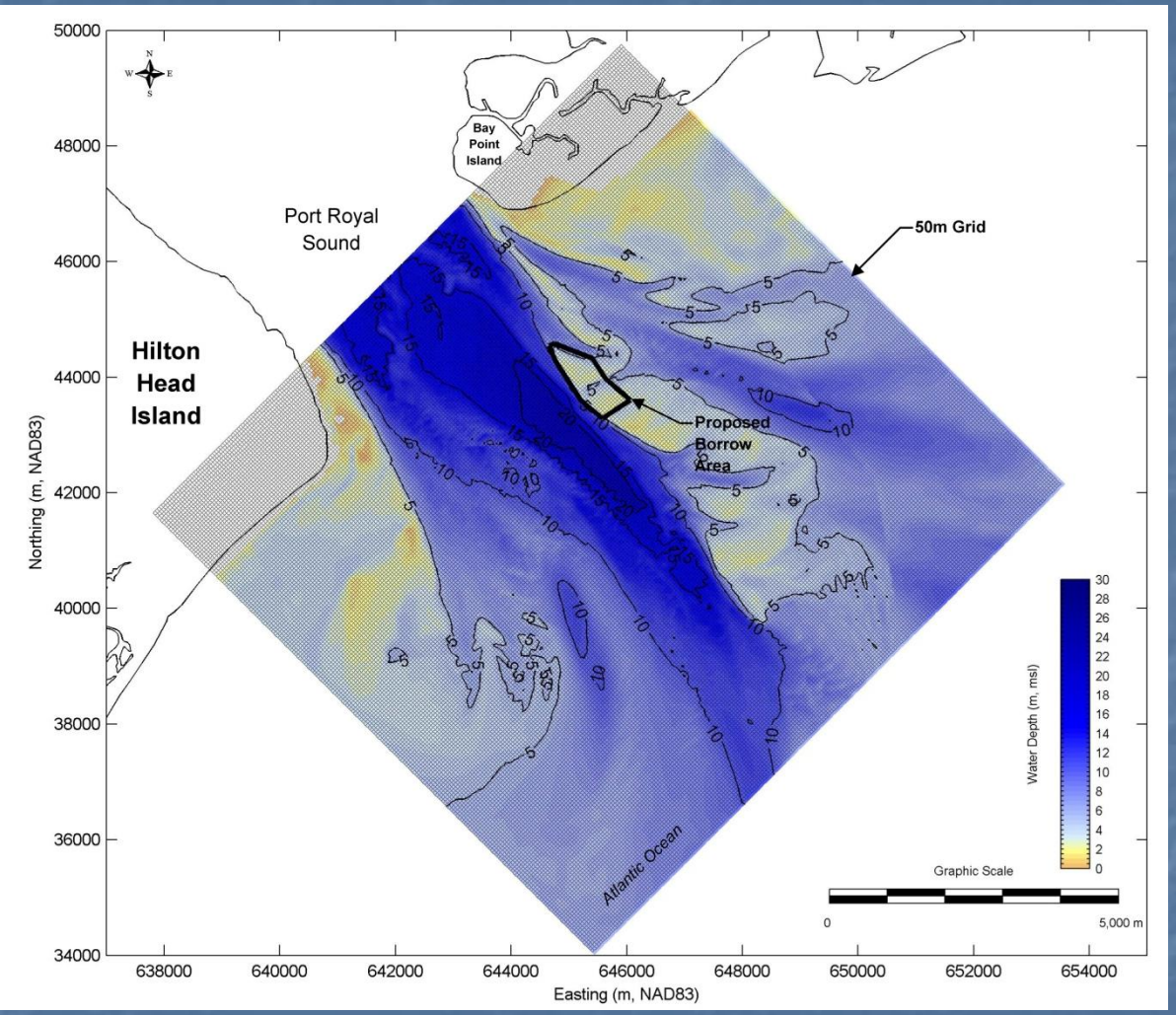
080-37-25.86W

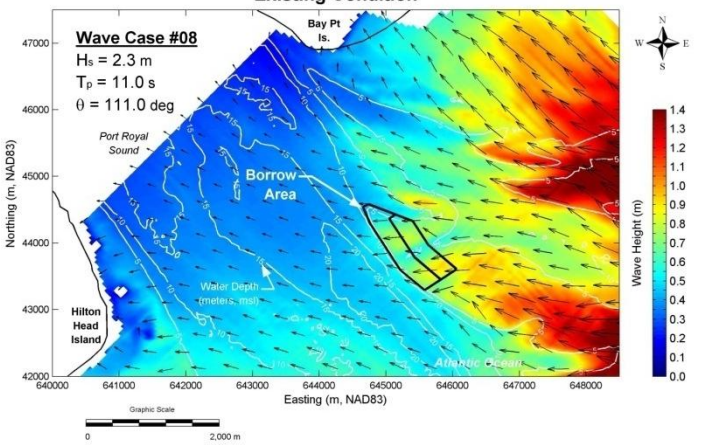

PORT ROYAL SOUND
Bay Point Island
HILTON HEAD ISLAND
Project Area
Joiner Bank
Vibracore Location (typ.)
2006/07 Borrow Area
Seabed Elevation (ft, NGVD29)
ATLANTIC OCEAN
GRAPHIC SCALE
Northing (International Feet - NAD83)
155,000
150,000
145,000
140,000
135,000
130,000
125,000
120,000
Easting (International Feet - NAD83)
2,095,000
2,100,000
2,105,000
2,110,000
2,115,000
2,120,000
2,125,000
2,130,000
2,135,000


HILTON HEAD ISLAND
PORT ROYAL SOUND
ATLANTIC OCEAN
Bay Point Island
Port Royal Plantation
PROJECT AREA
POTENTIAL BORROW SITE
Joiner Bank
Seabed Elevation (ft, NGVD29)
GRAPHIC SCALE
0
2,500
5,000
10,000 ft
Northing (International Feet - NAD83)
160,000
150,000
140,000
130,000
120,000
110,000
Easting (International Feet - NAD83)
2,060,000
2,070,000
2,080,000
2,090,000
2,100,000
2,110,000
2,120,000
2,130,000
2,140,000

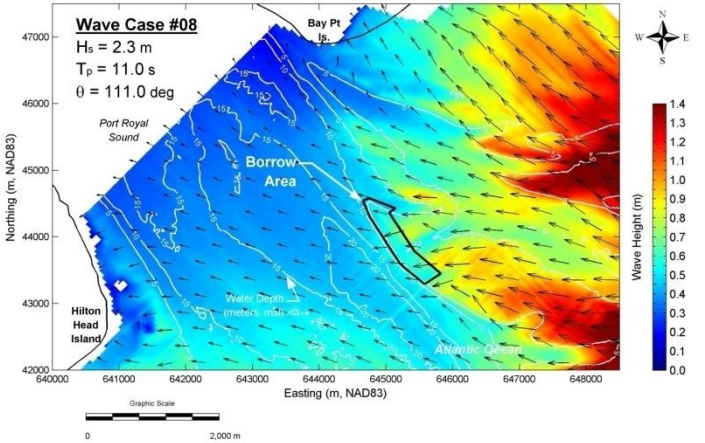

Delft3D
SWAN Wave Model
Computational Grids
100 m Grid
50 m Grid
333 m Grid
1000 to
500 m Grid
Hilton
Head
Island
Port
Royal
Sound
Edisto
Beach
Proposed
Borrow
Area
Atlantic Ocean
WIS-368
Little
Tybee Is.
Water Depth (m, msl)
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Graphic Scale
0
20,000 m
Northing (m, NAD83)
Easting (m, NAD83)
80000
70000
60000
50000
40000
30000
20000
10000
0
600000
610000
620000
630000
640000
650000
660000
670000
680000
690000
N
W
E
S



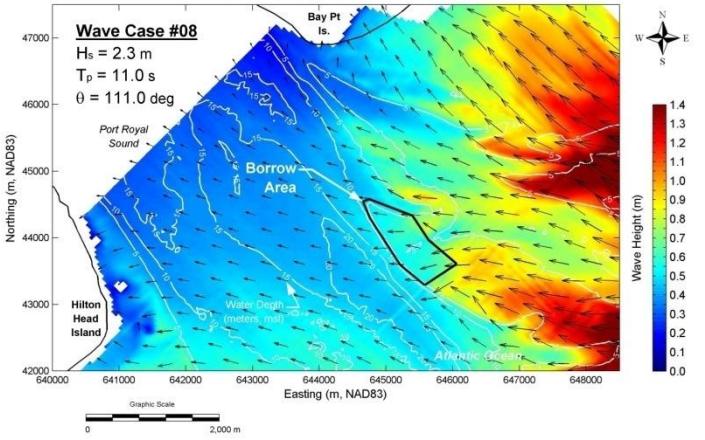
Existing Condition

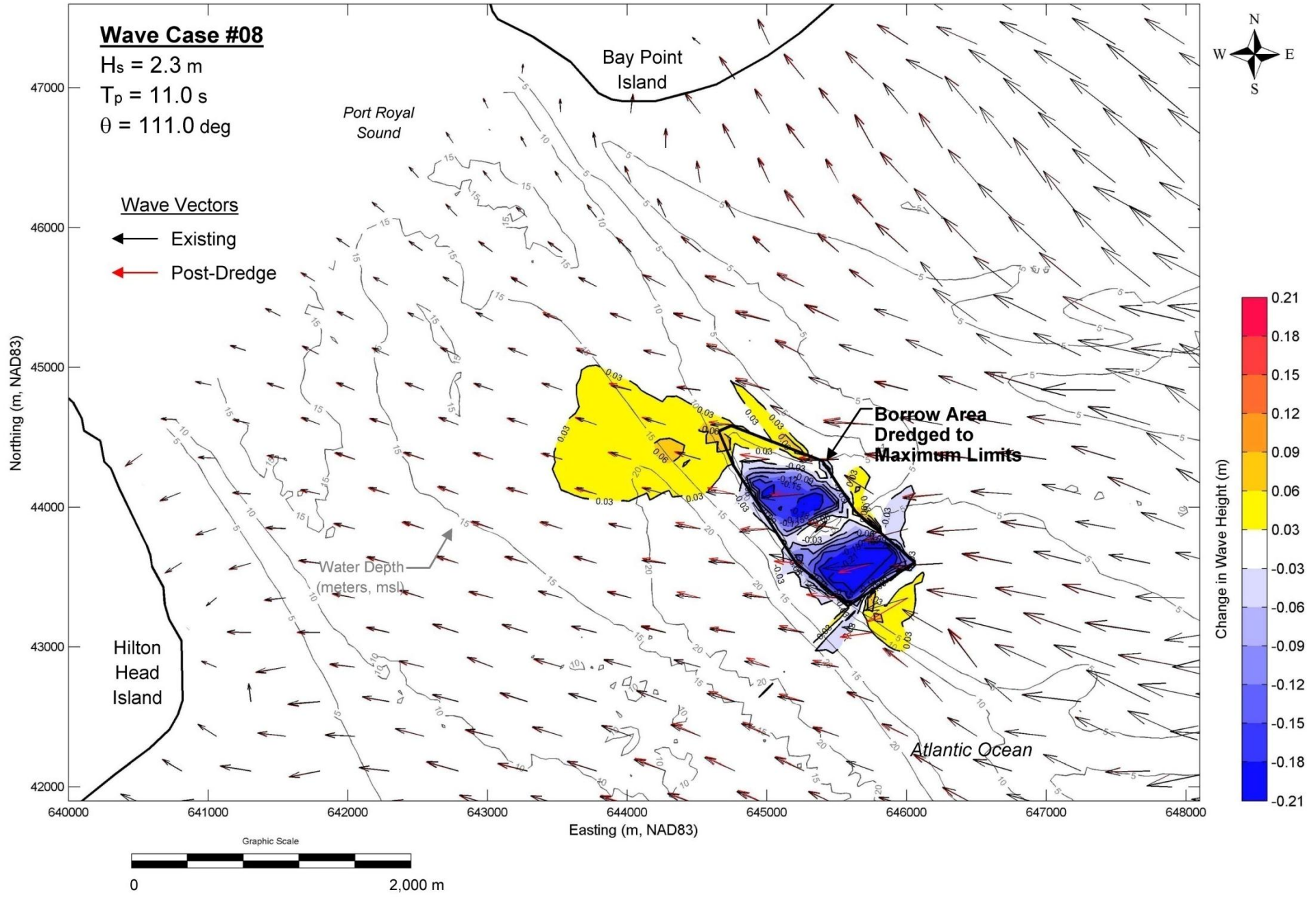


Borrow Area Dredged for Proposed Project



Borrow Area Dredged to Maximum Limits




Wave Case #08
Hs = 2.3 m
Tp = 11.0 s
θ = 111.0 deg
Wave Vectors
Existing
Post-Dredge
Bay Point Island
Port Royal Sound
Borrow Area Dredged to Maximum Limits
Water Depth (meters, msl)
Hilton Head Island
Atlantic Ocean
N
W
E
S
Change in Wave Height (m)
0.21
0.18
0.15
0.12
0.09
0.06
0.03
-0.03
-0.06
-0.09
-0.12
-0.15
-0.18
-0.21
Northing (m, NAD83)
47000
46000
45000
44000
43000
42000
Easting (m, NAD83)
640000
641000
642000
643000
644000
645000
646000
647000
648000
Graphic Scale
0
2,000 m

Program Future

- Continue Comprehensive Beach Monitoring Program
- Reduce long-term demand on available sand resources
  - Include strategic use shore-stabilization structures, as appropriate
- Continue to use reasonably accessible and economically feasible sand resources
  - To-date, search for sand resources has not extended beyond the ebb tidal deltas of Port Royal and Calibogue Sounds
- Continue to pursue (when available) beneficial use of beach compatible and economically feasible dredge materials in the region

Initiatives to Consider

- Expand Inventory of Known Sand Resources Into Federal Waters
- Investigate PRS ODMDS for Possible Future Sand Resource (~15.5 Mcy of sand disposed)
- Coordinate with USACE and Locals regarding beneficial use of dredge material from navigation projects. Make the process easier for locals to access material.


Thank You